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# THE DEVELOPMENT OF THE RAILWAY SYSTEM

NORTHUMBERLAND AND DURHAM,

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ADDRESS

to

JAMES RICHARD FLETCHER, M. Inst. C.E.,  
PRESIDENT

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21st NOVEMBER, 1901.

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1902.

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NEWCASTLE-ON-TYNE ASSOCIATION OF STUDENTS  
OF THE  
*Institution of Civil Engineers.*

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THE DEVELOPMENT OF THE RAILWAY  
SYSTEM  
IN  
**NORTHUMBERLAND AND DURHAM.**

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A D D R E S S  
BY  
**JAMES RICHARD FLETCHER, M. Inst. C.E.,**  
**PRESIDENT.**

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7th NOVEMBER, 1901.

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THE NEWCASTLE-ON-TYNE ASSOCIATION OF STUDENTS

OF

THE INSTITUTION OF CIVIL ENGINEERS.

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PRESIDENTIAL ADDRESS

OF

MR. JAMES RICHARD FLETCHER,

November 7th, 1901.

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THE first year of the new century is a suitable occasion to review the work done in this locality as a contribution to the great Railway System of the United Kingdom during the century that is past. In history it might well be known as the "Railway Century," as within its limits, railways have been introduced, nurtured, and matured into the highly developed means of transit which we now look upon as one of the necessities of life. Tyneside should be proud of the part her sons have taken in this work, for on her banks the first "waggon-ways" were laid, and the first effective locomotive steamed its noisy way.

The early "waggon ways" and tramways have been previously described in other Presidential Addresses to this Association; it will, however, be necessary briefly to refer to them, to shew how far they had advanced in the method of their construction, to have drawn attention to their merits as an economical means of transit, and to the advisability of obtaining some power for haulage upon them superior to that of horses.

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The Address was illustrated by a large Map of the district upon which the Railways were drawn as described in the chronological order of their opening.

The dates given unless otherwise stated refer to the dates of the opening of the several Railways.

"Waggon-ways" appear to have been first used in this country sometime in the reign of James I., when they were laid down on the banks of the Tyne for the conveyance of coal from the collieries to the river for shipment. They were first used on the Wear in 1693, and their use gradually spread to other mining districts in England and Scotland. They were made of wood, and one of the earlier designs consisted of hard wood rails 4 inches square, of about 6 feet in length, laid on cross sleepers of about 6 feet long placed two feet apart; the ballast was level with the top of these cross sleepers to allow the flanges of the wheels to run clear. This system was known as a "Single-way." The first of the many improvements made in permanent way was the introduction of the "Double-way," which consisted in fastening an additional piece of wood of the same dimensions on the top of the "Single-way," thus giving a stronger rail, a better joint between the rails, and enabling the ballast to be raised, and prevent the wear of the cross sleepers by the horses' feet.

Wagon-wheels were originally of wood; the first mention of cast-iron wheels was in 1754, after which they gradually came into use. Sometimes one pair of wooden wheels were retained for the better braking of the wagons. The brake was at that period called a *convoy*. It is doubtful when cast-iron wheels were generally substituted for those of wood. Mr. Losh obtained a patent for wrought-iron wheels in 1830.

In 1767 the plate-rail was introduced. It consisted of a short cast-iron plate with a vertical flange projecting upwards to retain the wheels in position, the wheels being without flanges; these were fastened direct on to the sleepers. An improvement was afterwards made by the addition of a curved flange on the underside to give additional strength. The use of the word "platelayer," to denote a surface man, has survived the plates he used to lay a hundred years ago. The great objection to these tram-plates was the friction of the wheels against the flange, and their liability to become choked with dirt. Iron tramways were in use in South Wales for many years before they were adopted on the Tyne.

The edge-rail for flanged wheels followed in 1789. This was simply a short fish-bellied cast-iron plate about 3 feet in length with a swelled top. The reduced depth at the ends gave it greater stability when attached to the sleepers by a flat flange cast on the rail; cast-iron pedestals or chairs were afterwards substituted. These rails being of cast-iron, readily lent themselves to alteration in detail of design. One of the many modifications of the edge-rail continued in use until gradually superseded by wrought-iron rolled rails; the principal improvement being the substitution of a half lap for the butt joint, for which Losh and Stephenson obtained a patent in 1816.

At a comparatively early period, malleable iron bars, 2-inch by  $\frac{1}{2}$ -inch, had been attached to the top of the wooden rails at curves and gradients, more to ease the draught of the horses than to reduce the wear. It was not until about 1805 that malleable iron was introduced as a substitute for cast-iron; at first the rails were formed of a simple rectangular bar—this being narrow, had a tendency to cut a groove in the wagon-wheels. It will be observed that the wear and tear of permanent way, and the tyres of wheels, which is such a large factor in the cost of maintenance of a railway, made itself apparent at an early date. In 1808 malleable iron rails were laid down on a wagon-way belonging to Lord Carlisle at Tindale Fell, in Cumberland; a report as to their condition in 1824 stated that they were very little the worse, and compared them favourably with the cast-iron rails at the same place. Wagon-ways having overrun this district,\* it was natural that the Ironworks, at Bedlington, should endeavour to meet their requirements. In 1820, Mr. Birkinshaw of the above Works, patented an ingenious method of rolling bars of a form similar to the fish-bellied rails then in use. In appearance the rail was like a number of cast-iron rails jointed together in one bar. This seems to have been the turning point in the history of rails. Malleable iron did not, however, at once displace cast-iron, for even so late as 1838 cast-iron was recommended as being more suitable for private railways; the cost of malleable iron was double that of cast-iron, and its supposed liability

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\* See Map, 1801.

to lamination and loss in weight by excessive oxidisation was urged against its introduction. The superiority of malleable iron rails, however, soon became apparent, and they came into use upon all public railways. Parallel rails of heavier weight were next used, of innumerable designs in section, and of gradually increasing weight. Steel rails followed about 40 years ago, and to-day parallel steel rails of over 90 lbs. to the yard, and 30 feet in length, are in general use, and in many cases 60 feet in length.

In describing the “waggon-ways” of the beginning of last century, enough has been said to give an idea of the kind of road upon which the locomotive had to make its first trials—a light cast-iron way with an indifferent joint at every yard, designed for an axle-load of about a couple of tons. If the permanent way of to-day had been in existence a hundred years ago, the early days of Locomotive Engineering would have been comparatively smooth.

The first locomotive engine—or, more properly, steam carriage—was invented by Cugnot, a Frenchman, in 1769 and 1770. Then follows:—

Oliver Evans, an American, in	...	...	1772
William Symington	...	...	1786
William Murdoch...	...	...	1781-6
Thomas Allan	...	...	1789

These were mostly models, and Richard Trevithick was the first to make a steam carriage of any practical use, for which he took out a patent in 1802. He also made a locomotive in 1803, and it was tried on a tramway in South Wales in 1804. These were the first high-pressure engines made. Both these engines were successful to some extent, but they were abandoned.

Blenkinsop, of Leeds, took out a patent in 1811, and he constructed an engine with a pinion working on a horizontal rack laid at the side of the tramway. This engine ran for many years, and gained great popularity. It could draw a load of 30 coal wagons at the rate of  $3\frac{1}{2}$  miles an hour.

Messrs. Chapman, of Newcastle, tried a cable-engine on the Heaton wagon-way, in 1812, worked by chain and drum—similar

to the chain-ferries now in use. It was found cumbersome and expensive.

Mr. Brunton, in Derbyshire, patented in 1813, a mechanical traveller, propelled by legs.

Mr. Blackett, owner of Wylam Colliery and "waggon-way," had an engine made under Trevithick's patent, which never left the works at Gateshead, where it was built. He then requested Mr. William Hedley, the viewer of the Colliery, to undertake the construction of an engine. After making experiments with a carriage worked by manual labour, Mr. Hedley "proved that the friction of the wheels of an engine carriage upon the rails was sufficient to enable it to draw a train of loaded waggons." He then constructed an engine, which he placed upon this experimental carriage. (Feb., 1813). It, however, worked badly, principally from want of steam, the boiler being of cast-iron which appears to have been the material used up to that date, at least for the shell.

Hedley's second engine, for which he obtained a patent 13th March, 1813, was tried in the following May (1813), and proved a success; the boiler, which worked at 50 lbs. pressure, was of wrought-iron, and was provided with a return flue. At first it was mounted upon four wheels, but it was found necessary to alter it to eight wheels, by placing it upon two bogies, on account of the lightness of the tramway, which was only laid with cast-iron plate-rails (these had superseded wood about 1808). After the line was re-laid with edge rails in 1830, the engine was restored to four wheels. The power was communicated to the wheels through gearing, and the wheels were without flanges to suit the plate-rail. If Mr. Hedley had had the edge-rail to conduct his experiments upon, his labours would have been considerably lightened. This engine, known as "Puffing Billy," worked on the Wylam Railway until 1862, when it was removed to South Kensington. Up to that date it had been an object of great interest to the passengers on the Newcastle and Carlisle Railway. Another of Hedley's engines is in the Museum of Science and Art, in Edinburgh.

George Stephenson was at this time employed as enginewright at Killingworth Colliery. He had been devoting his attention to the

improvement of underground haulage, and the construction of self-acting inclines for economising the cost of haulage to the River Tyne. On the 2nd September, 1813, one of Blenkinsop's engines was put upon the Kenton and Coxlodge wagon-way, about 3 miles from Killingworth, where it proved costly and too heavy for the road. Stephenson naturally went to see this novelty, and being acquainted with the working of Hedley's engine at Wylam, he determined to make a locomotive himself, and with the assistance of Lord Ravensworth, who provided the money, he built an engine which was put on the Killingworth wagon-way on 25th July, 1814. The result gave him sufficient encouragement to build others. The Killingworth engine had flanged-wheels running upon an edge-rail, a single flue to the boiler and a wide chimney ; instead of being an improvement upon the Wylam engine, it lacked some of its most salient features, and it was not until sixteen years later that Stephenson's engines were an unqualified success.

It is to be regretted that many writers have ignored Mr. Hedley's claim as having produced the first practical locomotive with smooth wheels running on smooth rails, and led to the popular error that Stephenson was the inventor of the locomotive engine\* ; this may be partly accounted for by the world-wide reputation Stephenson afterwards attained as a Railway Engineer, and his connection with Stephenson's Locomotive Works, and to Mr. Hedley remaining in comparative obscurity within the neighbourhood of the collieries in which he was subsequently interested.

There is yet another native of Wylam, who became prominent in connection with the early history of the locomotive—Timothy Hackworth, the foreman smith at Wylam Colliery. He assisted Mr. Hedley in making his engine, and in 1824 acted as Manager to Stephenson's Engine Works at Newcastle. In 1825, he entered the service of the Stockton and Darlington Railway, and had the supervision of the stationary and locomotive engines. He made great improvements in the working of the inclines, and constructed the "Royal George," in 1827—a six-wheeled engine with inverted

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\* The locomotive was more the result of gradual development than a specific invention.

cylinders. "This was the first of a new type of engine, and the nearest approach to the modern locomotive of any that had yet been built." The "Sanspareil" was built upon the same model.

About this period, there were many who advocated and foresaw the development of a railway system to embrace the whole country. George Stephenson, by taking advantage of the opportunities that came in his way, was enabled to identify himself with Railway Engineering when in its infancy, and by his ability, energy, and sound common-sense, together with his strong physique—an element so essential to a successful career—he overcame the difficulties with which he was constantly confronted in carrying out his work.

The first step in his career, as a Railway Engineer, was taken in 1819, when the owners of the Hetton Collieries having become acquainted with the work he had carried out at Killingworth, secured his services in connection with their proposed railway to the River Wear. The nature of the country made the adoption of inclined-planes necessary for the greater portion of its length, the highest point on the route, at Warden Law, being 600 feet above sea level. There were five self-acting inclines and two stationary hauling engines, besides the locomotive line. The railway was opened on the 18th November, 1822, when five of Stephenson's locomotives\* were at work on the line. The engines hauled 64 tons at the rate of four miles an hour.

An engine built by Stephenson is still at work at one of the Hetton Collieries. It is probably one of those above referred to, and has been in continuous work almost without intermission since that time. In executing the necessary repairs and renewals, there have been a few alterations made in the details of construction of both engine and boiler, but the main design is the same as when it left the maker's works. The cylinders are upon the top of the boiler, projecting into the steam space for 14 inches. There is the usual overhead gear; the cab is on the left-hand side of the boiler, but is not part of the original engine. The consumption per day of 11 hours is 10 cwt. of coal and 700 gallons of water. If the scope

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\*Three of these engines were abandoned, and supplanted by stationary engines in 1827.

of this Address would permit, many interesting details of this engine might be given, which would be of great interest, especially to Locomotive Engineers.

Acts of Parliament for the Surrey Iron Railway were obtained in 1801, 1805, and 1806. It was a horse tramway  $9\frac{1}{2}$  miles in length, from the Thames at Wandsworth to Croydon, with a branch of  $1\frac{1}{2}$  miles to Carshalton. This was the first railway promoted by public enterprise. It was opened in 1805. The Company existed until 1848, when it was dissolved.

The Canal mania of the latter part of the eighteenth century did not find a footing in the North, owing, probably, to the hilly nature of the country, the rivers Tyne, Wear, and Tees, together with the "waggon-ways" on their banks, supplying the demand, although the question of a canal from the Tyne to the Solway had frequently been proposed. On the Tees, Brindley reported on a canal which would have tapped the large coalfield in the Auckland district. In 1812, Rennie made a survey for a railway. Nothing, however, was done until Mr. Edward Pease of Darlington, by his persistent energy and perseverance formed a company for the purpose of making a railway from Stockton to Darlington. Overton made a survey of the proposed line, and an application was made to Parliament in 1818. The Duke of Cleveland opposed it, and the Bill was thrown out by a small majority. To Mr. Pease is due the credit of being the promoter of one of the earliest public railways, and the Duke of Cleveland stands as that type of opposition which all the earlier railways had to contend with from the county magnates and large landed proprietors—that opposition which had such a baneful effect on the economic laying out of the railway system of Great Britain. Another Bill was presented in 1819, when the line was altered to avoid the Duke of Cleveland's land. Owing to the Dissolution of Parliament, its passing was delayed until the 19th April, 1821. On this railway it was proposed to lay a tramway of wood and work the traffic by horses.

An interesting date in the history of the Stockton and Darlington line was that on which George Stephenson, accompanied by Mr.

Nicholas Wood\* (Viewer of the Killingworth Colliery), called upon Mr. Pease, in the spring of 1821, to offer his services in connection with the construction of the railway—this was about a year prior to the opening of the Hetton Railway. The experience already gained in the construction of that line had no doubt given him confidence in his ability to carry out the Stockton and Darlington line successfully. After enquiries and negotiations, Stephenson was engaged to make a new survey, with deviations that he had suggested, and which shortened the line by three miles. An amended Act was obtained in 1823, under which, on his advice, power was taken to work the railway by locomotive engines for the haulage of both passengers and goods. *This is the first clause in any Railway Act that relates to working passenger traffic by locomotives.* In the meantime a commencement had been made with the line on the portions not affected by the proposed deviation, and the first rail was laid near Stockton on the 23rd May, 1822. George Stephenson was appointed Engineer, and on his advice iron rails were substituted for wood, and the gauge kept the same as the existing line at Killingworth. He also recommended wrought-iron rails in preference to cast, but on account of the cost they were only partially used. During the construction of the line, Stephenson had convinced Mr. Pease and the Directors of the value of the locomotive; and with the assistance of Mr. Pease and another, he purchased a piece of land in Forth Street, Newcastle, for the purpose of building works for their construction. Some time about 1823, Stephenson's factory commenced work, and three engines of his design were built there for the Stockton and Darlington Railway. He had previously had an interest in a small foundry in Forth Street. †

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\* Author of a "Treatise on Rail-Roads." Elected a Member of the Inst. C.E. in 1829. First President of the "North of England Institute of Mining Engineers" (1852).

† Mr. Robert Hawthorn, son of the Duke's Engineer at Walbottle Colliery, opened Engine Works, in 1817, on the western side of Forth Banks, removing in 1819 to the site of the present works. The following year he took his brother William into partnership (R. and W. Hawthorn.) They commenced building Locomotives in 1831. The elder Hawthorn had never been friendly to Geo. Stephenson, who had worked under him at the collieries, in fact, Stephenson always regarded him as his enemy. This feeling was shared by the two firms of Stephenson and Hawthorn, whose works were adjacent to each other, and at one time it was found necessary for the workmen to take their dinner hours at different times, to prevent a collision between them. In the opening of many local railways, the rival firms had each a locomotive running at the opening ceremony.

The railway from Stockton to Witton Park Colliery, near Etherley, was publicly opened for traffic on the 27th September, 1825, amid great excitement. The details of this most important and historic event are so well known to all, that it is unnecessary to describe it. The locomotives proved a success,† drawing the ceremonial train of 38 wagons with goods and passengers, and a primitive carriage with the Directors. At first locomotives were confined to the conveyance of goods and minerals, the passenger coaches being worked by horses, and the working let to different job masters. The first carriages were converted coaches, one being formed of two mourning coaches. This design of carriage building was followed for many years. The railway was a single line with sidings at intervals, and worked without signals—a sort of go as you please arrangement—and much delay, annoyance, and amusement was caused by the rival coaches and goods trains meeting on the single line.

In the Act provision was made for the use of the railway by the public with their own rolling stock, provided the necessary tolls were paid. This continued until 1833, when the company bought out the various parties interested, and took over the working of the line into their own hands.

The famous Gaunless Bridge of four spans of 12 feet over the River Gaunless, at West Auckland, was upon this line. It is supposed to be the first Iron Railway Bridge erected. It is of curious design, of wrought and cast-iron. It has only been removed this year, and it is probable it may be re-erected in some public place.

In 1827 the Black Boy Branch was opened, and in 1830 a Branch was made to Hagger Leazes, called the Hagger Leazes Branch.

Although the Stockton and Darlington Railway was a success, the real date of the inauguration of Public Railways was not until five years later, when the Liverpool and Manchester Railway was opened on 15th September, 1830. The successful completion of this line was greatly due to George Stephenson, who, by his ability and

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† The subsequent working of these engines did not bear out their first promise of success.

untiring energy, overcame the enormous difficulties encountered in its construction. It was also through his influence that the locomotive was adopted in preference to fixed engines, which at that time had many advocates, due partly to the general prejudice against locomotives and to their doubtful efficiency, the unsatisfactory working of those already in use giving ample evidence against them.

Mr. Robert Stephenson was at this time assisting his father as manager of the Engine Works, at Newcastle. Shortly afterwards he devoted himself to Railway Engineering, and during his career rose to the very highest rank in his profession, and was elected President of the Institute of Civil Engineers in 1855.

The Clarence Railway was projected, by some capitalists in Stockton, to compete with the Stockton and Darlington line; it was opened about 1833, from Simpasture, on the S. & D. to Port Clarence, where staiths were erected on the River Tees; it was extended to Coxhoe, and branches made to Stockton North Shore and Chilton, the dates of the opening of these are doubtful, but probably in 1833 or 1834. The Byers Green Branch was opened in 1837, from which a short Branch to Page Bank Colliery was afterwards made, (about 1862). The coal from the South-West Durham Collieries passed on to the Clarence Railway from the S. & D. at Simpasture, where there was a great deal of friction between the servants of the rival Companies. The railway was principally used for coal traffic, and it proved unsuccessful, for some time the principal traffic on it was from Mr. William Hedley's (late of Wylam) Crow Trees Colliery, at Coxhoe. In 1835, the first locomotive was put on the line by Mr. Hedley. The Railway was afterwards purchased by the West Hartlepool Harbour and Railway Company, which was amalgamated with the North-Eastern Railway, in 1865.

The Newcastle and Carlisle Railway has many points of interest. Although it was not wholly opened until 1838, its history dates from a much earlier period. In 1795 and '96, Mr. William Chapman published plans of a scheme for a Canal between Newcastle and Maryport; it was not proposed to utilize the River Tyne, as the Canal was laid out at a much higher level on its northern bank. In 1800, Mr. Thomas read a Paper before the Literary and Philosophical Society,

at Newcastle, in which he advocated the construction of a Canal between Newcastle and Carlisle, or a Railway similar to the coal "waggon-ways," for the conveyance of goods and passengers by horse-power.

On the 21st August, 1824, a meeting was held in Newcastle, by order of the High Sheriff, to consider the question of a Railway from Newcastle to Carlisle. The merits of a Railway and a Ship Canal were discussed, and a Committee, appointed to consider the rival schemes, reported in favour of the Railway. The Act was obtained on the 22nd May, 1829, so that it may fairly be considered as the pioneer Railway of the Newcastle district.

The first portion was opened on the 9th March, 1835, between Blaydon and Hexham. Two trains were run to Hexham and back with the invited guests; one train was drawn by the "Rapid," built by Stephenson, and the other by the "Comet," built by Hawthorn. There were the usual bands of music, flags, ringing of bells, firing of cannon, and enthusiasm—not omitting the banquet which was deemed necessary for the opening of a Railway. The speed attained on this trip was about 12 miles an hour. A service of about four passenger trains commenced the following day, but this was contrary to the Act, which had only been granted on the condition that locomotives were not to be used. The Directors had previously given notice (November, 1834), that they intended to apply to Parliament for authority to run locomotives, in which great improvements had been made since they had obtained their first Act. The consent of all the land owners was obtained with the exception of C. Bacon Grey, Esq., of Styford Hall, who obtained an injunction against them, and consequently the line was laid idle. This created such indignation in Newcastle, that the power of public opinion overcame his opposition, and traffic was resumed on the 6th May.

A further portion of the line, from Hexham to Haydon Bridge, was opened on the 28th June, 1836, with the usual festivities, the engines "Hercules," by Stephenson, and "Samson," by Hawthorn, drawing the trains.

The section from Carlisle to Greenhead was opened in July, 1836.

The Newcastle and Carlisle Co. took over and constructed the western portion of the Blaydon and Hebburn Railway Co.'s project from Blaydon to Redheugh, at which latter place they formed their terminus; it was opened in March, 1837. The Canal Branch at Carlisle was opened in the same year; and the remainder of the line between Haydon Bridge and Greenhead was opened in the following year.

The following description\* of the opening is a typical account of the ceremonies which accompanies the opening of the early railways.

"On June 18th, 1838, the Newcastle and Carlisle Railway was opened throughout its whole extent, from Redheugh, a little to the west of Gateshead, to the city of Carlisle. The vast number of ladies and gentlemen who had assembled for the purpose of travelling to the other end of the line, the countless spectators, and the numerous bands of music, made up a scene of great animation and gaiety. At half-past twelve o'clock the signal was given for the engines to start, when the "Rapid" was despatched as an advance guard without any train, and was followed by 13 other engines drawing 120 well-filled carriages. The aggregate number of passengers in all the trains was estimated at nearly 4,000, and the trains, when close together, above half a mile in length. The gay procession was received with great enthusiasm along the route, particularly at Corbridge, Hexham, and Haydon Bridge, and the whole party reached Carlisle between five and six o'clock. The shades of night had set in before the trains commenced their homeward journey, and the first did not arrive at Redheugh until between two and three o'clock in the morning, and many of them at a much later hour."

There are a few features of this Railway which give it an individuality of its own, because it appears to have been constructed independently of the influence of the Stephensons. It was laid out as a horse railway. This, and the desire to avoid going through the land of opposing landowners, may account for the many sharp curves

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\* "Local Records" by T. Fordyce, 1867.

to be found upon the line. The gradients are fair, considering it had to rise over the watershed at Gilsland, a height of 450 feet above sea level, where there is a level portion six miles in length. The descent on the west side is steeper than upon the east, the ruling gradient being 1 in 107. The rails were laid to the 4 ft. 8½ in. gauge on stone blocks, and in constructing portions of the line the two centre rails were laid first as a single line, and the wagons run on the "six-foot way." This railway, like most of the early railways in this district, up to 1864 adopted the narrow "six-foot way," which is now found so difficult to eliminate, especially through tunnels and over viaducts. The trains were run on the opposite lines as at present, viz., on the right-hand instead of the left-hand side of the road. This practice was continued until 1864, after the line was purchased by the N.E.R. The platforms were all low, as can be seen by the level of the station buildings. This custom was usual in the early railways, and might still be in general use, as on many foreign railways, but for the requirements of the Board of Trade.

There is a very fine viaduct of old red sandstone over the Eden at Corby, which stands to-day, after 70 years, in as good condition as on the day it was built, never having required any repairs—not even pointing. It has five spans of 80 feet. A tablet built into the bridge bears the following inscription:—"Corby Bridge. Francis Giles, Civil Engineer. William Denton, Builder. 1831-1834." It is satisfactory to note that the names of those to whom we are indebted for so excellent an example of good workmanship and design have been handed down to us.

The skew viaduct over the Gelt is of similar design to the Corby Viaduct. In the same neighbourhood is the Cowran Cutting, 1 mile in length and 100 feet in depth at the deepest part. It was proposed to drive a tunnel through the hills at this place, and a portion of it was built, but it had to be abandoned on account of quicksands, and an open cutting substituted. When the cutting was made, it was found that many of the neighbouring springs were drained dry, and compensation water had to be provided by the Railway Company. At the present time, the cutting provides the district of Wetheral with an excellent supply of water.

The different sections of this line were under the direction of different engineers and contractors. It is to be regretted that the design of the Corby and Gelt Viaducts had not inspired the engineers of the four viaducts over the South Tyne and River Allen, for these were only built of timber trusses. The bridge at Warden was destroyed by fire in 1848, and replaced by a cast-iron bridge, of curious construction, consisting of cast-iron girders, designed to represent arches, arched ribs without any provision being made to take the thrust. This viaduct is about to be reconstructed on a different site. The other viaducts were replaced by wrought-iron girders in 1865.

Single top rails, 15 feet in length, and about 70 lbs. to the yard, were in use on this line until 1865, when they were replaced by double-headed 82 lb. rails. Previous to 1856, fish plates were not in use, the joints being made on a joint chair.

The Stanhope and Tyne Railway—now called the Pontop and South Shields—was originally a private railway. It was not incorporated by Act of Parliament until 1842, up to which date it went through great financial troubles; to-day it is one of the busiest mineral lines in the kingdom. The line was projected about 1831 or 1832. The western terminus was at the Lime Quarries, on the north bank of the River Wear at Stanhope, from whence the railway ran over 10 miles of wild moorland country to Carr House, necessitating many inclined planes; crossing the ravine at Hownes Gill by two very steep inclines, where the wagons were run separately on to a platform, which was lowered to the bottom of the Gill by a hauling-engine, and the wagon transferred on to a similar platform, to be pulled up the other side. The wheels of the platforms were of different sizes, so that the wagon always maintained a horizontal position. The line afterwards passed through Annfield, Stanley, and Washington, to South Shields, where coal drops\* were constructed at the mouth of the River Tyne. The railway west of Annfield Plain was formally opened on the 15th May, 1834, when it took three hours for the ceremonial wagon to travel from Annfield

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\* *Transactions Inst. C.E.*, vol. ii., 4to., p. 69.

to Stanhope (about 16 miles), unfortunately, a fatal accident, caused by the breaking of a shackle, marred the festivities. The remainder of the line was opened some six months later, on the 10th of September, 1834, when a train of 100 wagons of coal were brought from Medomsley Colliery, and shipped at the new coal drops at South Shields. The opening created much local interest, a dinner was given to a thousand of the workmen, the directors and their friends had a banquet in honour of the occasion, an interesting account of which was published in the *Newcastle Journal* of September 13th, 1834. The only portion of the railway worked by locomotives was between South Shields and Fatfield, a distance of about  $9\frac{3}{4}$  miles. On the remainder of the line there were numerous inclined-planes, some worked by stationary engines and others self-acting, the haulage on the "levels" being entirely done by horses. A few passenger trains were run between South Shields to Stella Gill, but these have been discontinued for many years.

The whole of the railway was formed on the "wayleave" system, a method which had been in general use in making the numerous wagon-ways in the district, whereby the landowners through whose land the railway passed were paid an annual charge or rent. This obviated the necessity of going to the expense of obtaining an Act of Parliament. The annual "wayleave" charges on it amounted to about £300 per mile. Several lines now amalgamated with the North-Eastern Railway have "wayleave" charges.

The finances of this Company were badly managed, and it became practically bankrupt in a few years. Mr. Robert Stephenson had been employed in its construction, and having accepted payment for his services in shares, he found himself personally liable for its debts, and at one time ruin stared him in the face, the Company not being incorporated, and the Limited Liability Act being of a later date. The difficulties were, however, eventually overcome by forming a new Company in 1841, with a capital of £400,000, for the purpose of purchasing the line, an Act for which was duly obtained in 1842, under the title of "The Pontop and South Shields Railway Company." The Directors entered into an agreement with the projectors of the Newcastle and Darlington Railway, by which a

portion of the line between Washington and Brockley Whins should form part of the route to Newcastle. The line was eventually sold to them at a profit.

The Harelaw and Medomsley Branches were opened about the same time as the main line.

In 1839, the line between Stanhope and Medomsley got into bad repair, and was laid in. It was afterwards sold to the Derwent Iron Company (now the Consett Iron Company), and subsequently passed into the hands of the Stockton and Darlington Railway Company, under the name of the Wear and Derwent Railway. The original portion of the line between Waskerley and Hownes Gill was abandoned on the opening of the Waskerley Deviation in 1859.

In 1857 a Bridge was substituted for the Level Crossing over the Durham Turnpike, at "Fat Nelly's," south of Birtley, and three additional miles of the railway from Fatfield to Stella Gill—including the Vigo Bank—turned into a locomotive line. This necessitated making new reception sidings at Stella Gill at the foot of Waldrige Incline, in place of those at Fatfield. In 1886 the Loud Bank was abandoned, and a locomotive line substituted, under the title of The Annfield Diversion. This enabled all the line West of Stanley Bank Head to be worked by locomotives, with the exception of that portion of the old Stanhope and Tyne, between Waskerley and Stanhope. The three self-acting inclines at Stanley, Eden Hill, and Waldrige and those between Waskerley and Stanhope are still in use. In 1896 the line between Carr House and East Castles was altered to meet the requirements of the Board of Trade, and a passenger service is now run by this route to Blackhill by a new branch line at Consett.

The first Act for the Hartlepool Dock and Railway was obtained in 1832, for the purpose of establishing a Dock at Hartlepool for the shipment of coal from the Collieries in South-East Durham. It was opened to Wingate and Haswell in 1835, and was projected to run as far as Moorsley, but has not been made beyond Haswell. There were also short branches to Thornley and Ludworth Collieries. In making the line, a cutting 90 feet deep had to be

made at Trimdon, and embankments at Hesleden, Castle Eden, and Pesspool, 80, 70, and 60 feet in height respectively. A long incline, with a gradient of about 1 in 40, was necessary at Hesleden; this was afterwards flattened to 1 in 50 for a locomotive line, about 1874.

An Act for the Durham and Sunderland Railway was obtained in 1834. The line ran from Hendon to Murton, which stands at an elevation of about 400 feet above sea-level—a distance of about  $6\frac{1}{2}$  miles—with a Branch to Sherburn near Durham, and a Branch to Haswell, joining the Hartlepool Railway. On it are three inclines between Hendon and Murton, and five between Murton and Durham, which were worked by stationary engines from 42 to 85 horse-power. A commencement was made in 1835, and the line opened to Murton in 1836. The Durham Branch was opened in 1839, and the Junction with the Hartlepool line in the same year. The line was sold to the York, Newcastle, and Berwick Railway Co. The stationary engines were afterwards abandoned, and the line worked by locomotives; the gradient of Ryhope and Seaton Bank, on the main line to Hartlepool is 1 in 40. There were several sharp curves at Ryhope, Murton, and Haswell, which were altered in 1891 and 1893, partly on account of an accident which occurred in 1889, at Ryhope, and partly on account of the fast service to Manchester and Liverpool passing over this route.

An Act was obtained in 1834, for making the Durham Junction Railway from the Stanhope and Tyne at Washington to Moorsley near Haswell, in connection with the Hartlepool line—this was to complete the communication from the Tyne to the Tees, *via* Haswell and Hartlepool. This line was made as far as Rainton, and opened 24th August, 1838. The opening was attended by several members of the British Association, whose annual meeting was held in Newcastle in that year. The principal feature of the line is the Victoria Bridge, over the Wear. It is 157 feet in height, and 610 feet in length, of 10 arches of varying spans. The greatest span over the river is 160 feet. A portion of the arch stones of the larger arches are composed of granite. Passenger trains were run from South Shields to Rainton—about 4 miles from Durham.

The London and Birmingham Railway was opened in the same year (1838). The success of this undertaking was also due to the Stephensons, who added much to their experience and to their reputation. Their drawings for the various works upon it were afterwards used as a standard by many engineers.

The Brandling Junction Railway was proposed by Mr. William Brandling, to connect Gateshead, Sunderland, and South Shields. A Company was already in existence, the Blaydon and Hebburn Railway Company, whose scheme was laid out at a lower level. Mr. Brandling had approached them with a view to a partial fusion of the two schemes, in which attempt he was not successful. He had submitted the plans of both schemes to Mr. Robert Stephenson and Mr. Brunel, who recommended Mr. Brandling's line. A meeting was held in Newcastle, on the 27th August, 1835, for the purpose of forming a company, at which the following resolution was carried:—"That as the Carlisle and Newcastle Railway is now approaching its proposed termination at or near the latter town, it is highly desirable that it should be extended, in the most eligible direction, to the mouths of the Tyne and Wear, so as to connect these rivers with each other, and with the Carlisle Canal and Solway Firth, and that the line proposed by Mr. Brandling for uniting the important towns of Gateshead, Newcastle, Shields, Wearmouth, and Sunderland by railways, which will not exceed 16 miles in length, appears to this meeting to be the most eligible plan of accomplishing the above purpose, as well as affording all the advantages of a railway communication to the inhabitants of these populous and flourishing towns." Capital proposed, £110,000.

The Royal Assent had been previously given to the Act, on July 30th, 1835. The Company was formed, and the first sod turned on the 8th August, 1836. Arrangements were come to with the Blaydon and Hebburn Railway Co. by which that portion of their scheme eastward of Redheugh was taken over, and the line from Redheugh to Hillgate Depôts was opened on the 15th January, 1839; from South Shields to Monkwearmouth, 18th June, and from Gateshead to Monkwearmouth, 30th August of the same year, when 61 wagons of coal from South Beaumont Colliery were shipped at

Monkwearmouth Dock, to which a short branch (North Dock Branch) had been made.

On the opening of the Railway, the terminal stations were at Oakwellgate—Gateshead; West Holborn—South Shields; and Portobello Lane—Monkwearmouth. Extensions were made in 1842 to near the Market Place, South Shields, and to Sheepfold Lane, Monkwearmouth, and in 1844, in connection with the opening of the Newcastle and Darlington Railway, to Green's Field, Gateshead, where stations of some architectural pretensions were built. The Monkwearmouth Station is still in use, and the latter is absorbed into the Locomotive Works of the N.E.R. There was also a Station at Springwell, where the line passes under the Springwell and Jarrow wagon-way, upon which passengers were conveyed in a primitive manner to Jarrow, then a place of little importance. This Station was closed in 1872, on the opening of the Pelaw and Tyne Dock Branch.

The Teams Branch, which was opened about the same time (1839), was a short line from Redheugh, making a connection with the Tanfield Lea Railway at Lobley Hill incline. It was projected by the Blaydon and Hebburn Railway Co., who had entered into an agreement with the Marquis of Bute to make it, and ship his coals at Hebburn or Jarrow within five years of the passing of their Act, and for the non-fulfilment of the agreement, the Brandling Co. had to pay compensation for the extra cost of carrying the coals from Dunston by keels.

The Tanfield Lea Railway was an old "waggon-way" belonging to the Marquis of Bute, used for the purpose of shipping coals from the Tanfield Collieries at Dunston, west of the Teams Gut, and adjacent to the shipping places of the collieries belonging to Lord Ravensworth. This line was taken over by the Brandling Junction Railway Company and re-modelled, and, together with the Teams Branch, now forms the Tanfield Branch. It had a connection with the Harelaw Branch at Tanfield Moor, now disused. It has also a connection at Marley Hill with several collieries at Burnopfield, &c., which now forms part of the Pontop and Jarrow (formerly Spring-

well and Jarrow) private railway. The line rises over 800 feet in seven miles, and was worked principally by self-acting inclines and stationary engines. The latter have been superseded by locomotives. The self-acting inclines at Lobley Hill, Fugar Bar, Sunniside, and Tanfield Moor are still in use.

The whole of the Brandling Railway had the then usual narrow "six-foot-way," and there was a very narrow tunnel at Heworth, which was removed in 1896, when the line was doubled from Felling to Pelaw.

The steep incline of 1 in 20 at the Rabbit Banks, Gateshead, which formed the connecting link with the Newcastle and Carlisle Railway at Redheugh, was worked by a stationary engine; it has long since been removed, and trains are now assisted up with one or more "bank" engines as necessity requires. This Company shortly afterwards lost its identity by absorption into the Newcastle and Darlington Railway Company.

In 1830, Mr. Joshua Richardson, M.I.C.E., published a pamphlet advocating a railway between Newcastle and North Shields. Shortly afterwards he was engaged with Mr. Robert Stephenson in surveying a line, but being dissatisfied with it, he re-surveyed a line on a lower level. In 1835, a meeting was held in Newcastle for the purpose of forming a company to carry out Mr. Richardson's proposal. The proposed line was a single one, and skirted the riverside from the Stock Bridge, Newcastle, to Bedford Street, North Shields, with a short tunnel at the Newcastle end. There was also an extension at each end to Skinner Burn and Pow Dene, both by means of tunnels. Mr. John Straker, who was interested in the railway, proposed a more direct line at a higher level, an Act for which was obtained in 1836, and the railway opened on 18th June, 1839, with the usual festivities. The Newcastle terminus was at the Manors, the Station House is still standing behind the gaol. The line is nearly straight, with easy gradients.

The principal feature of its construction was that timber was used in the bridges and viaducts. The former were in the form of bow-string girders with laminated booms. An excellent example of

this type of timber bridge is given by Haskoll, in his work on Bridges, where details are given of a bridge 121' 6" span over the River Ouse. The viaducts over the Ouseburn and Willington Gut have spans of 116 and 120 feet, they consisted of laminated timber arches with timber spandrels and decking, the abutments and piers being of stone. These arches were designed by Messrs. John and Benjamin Green, architects, of Newcastle, and exhibit great skill and daring in their inception. There is an example of their work still standing in a foot-bridge over the approach to the station at Borough Road, North Shields, near the Ferry Landing; this bridge is the property of the Railway Company. These viaducts were in course of construction during the visit of the British Association to Newcastle in 1838, when several of the members inspected the work. The wear and tear of traffic, and the increase in the weight of the rolling stock, soon began to tell upon these structures, the deflection became considerable, and in 1867 it was found necessary to renew the Ouseburn Viaduct with iron. In carrying out the work the same design was maintained, the timber decking being supported upon staging, thus forming a temporary bridge. The Willington Viaduct was afterwards treated in a similar manner. This decking remained until recently, when the Ouseburn Viaduct was re-decked with iron in 1896, and the Willington Viaduct in 1898. An additional viaduct was built at the north side of the Ouseburn Viaduct of the same design in connection with the doubling of the line between Manors and Heaton in 1887.

The railway was afterwards extended in March, 1847, to Tynemouth; a cut and cover tunnel being built under the town of North Shields, half-a-mile in length. About 1877, several portions between the streets were opened out to obtain better ventilation, when it was found that the brickwork in the arches was formed of bricks placed on end, forming two 9" rims instead of four 4½" rims according to the usual practice. One of the difficulties to be overcome in its construction was dealing with the town drainage and sewage, and, in accordance with the Act, the sewer was placed in the bottom of the tunnel, and it is now about to be reconstructed.

On the 19th October, 1839, the first edition of "Bradshaw's Railway Time Table" was published, price sixpence, being of small dimensions, and consisting of 24 pages, 10 of which were devoted to two maps and town plans of Liverpool, Manchester, and Leeds. In the address it states:—"This book is published by the assistance of the several Railway Companies, on which account the information it contains may be depended upon as being correct and authentic." This might well be so, as all the tables, with one exception, give only the time of starting; the times of arrival and departure at intermediate stations is left to the imagination of the traveller. Prominence is, however, given to the fares; those between Liverpool and Manchester being quoted for "Inside" and "Outside"; and, in a later edition on Newcastle and Carlisle, quick trains—close carriages and open carriages. Mixed trains\*—close carriages and open carriages—all at different fares.

Another edition, dated 1840, was slightly enlarged. Profiles of a few railways are added, together with a map of England, on which are depicted 42 railways of a total mileage of about 1,650 miles,—about the same mileage as the N.E.R. of to-day (1,656 miles). In this map, the railways were given a number for reference—a similar system has been adopted in the maps at present in use.

A later edition, dated 1844, consists of 72 pages with additional maps, town plans, profiles, cab fares, &c. Bradshaw has grown considerably during the 62 years of its existence; it has increased in size, and now contains 1,068 pages.

A railway with the imposing title, "Great North of England, Clarence, and Hartlepool Railway," was only about eight miles in length. It boasted of four Acts of Parliament, the first of which was obtained in 1837. The line was opened in 1839; it joined the Hartlepool Railway at Wingate, and it was intended to tap the Byers Green Branch of the Clarence Railway at Thinfold. The owners of the Clarence Railway offered great opposition to the junction with their railway, as it would divert the traffic to Hartlepool off their own line. It was afterwards leased to the

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\*Mixed trains of passengers and goods.

Hartlepool Dock and Railway Company under an Act in 1845. The shareholders still receive the dividends due to the lease which is in force under the North-Eastern Railway. An Act was obtained in 1847, to connect this railway with the Great North of England Railway by a branch called the Thinford Branch.

By an Act in 1840 railways were first brought under the control of the Board of Trade, who appointed Inspectors, controlled the bye-laws, &c. Between 1846 and 1851 their duties were transferred to a special Railway Board, owing to the increase in the number of railways. Since then the Board of Trade have resumed their control under a special Railway Department. Under the "Requirements for the Opening of Railways" \* in 1858 they fixed the width of the six-foot way at six feet, and in 1883 they notified that the use of cast-iron in under-bridges was prohibited, except in the form of arched-ribbed girders. The distance of any standing work—such as signals, abutments of bridges, &c.—from the rail has been defined only as to its relation to the width of the widest carriage in use on the line, which latter has proved a variable quantity.

The Load and Structure-Gauges of the different Railway Companies vary considerably, both in form and dimensions, from various causes, and the free interchange of rolling stock and loads, which are frequently of abnormal dimensions, has been much impeded.

In 1840, the first portion of what became the Blyth and Tyne Railway was opened from Seghill to Percy Main. This district had many wagon-ways running to the shipping places at the Tyne, Seaton Sluice, and Blyth; their adaptation to the heavier traffic of locomotives and their extension, gradually developed into what eventually became a very successful railway. It was incorporated in 1852, and transferred to the North-Eastern Railway, in 1874, at a substantial profit.

In 1840, the Stockton and Hartlepool Railway Company opened their line from Middleton, near East Hartlepool, to Billingham,

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\*These requirements only refer to passenger lines.

†"Standard Load-Gauges on Railways." Minutes of Proceedings Inst. C.E., vol. cxliv., p. 215. (1890-1).

where it joined the Clarence Railway, which was afterwards purchased by them. The railway was incorporated in 1842.

The West Durham Railway was opened in 1840-41. It was practically an extension of the Byers Green Branch of the Clarence Railway to the West Durham Collieries, near Crook. It was a coal line, and worked by inclines; the greater portion of it is now abandoned.

In 1841, the Great North of England Railway was opened from York to Darlington.

In the same year the London and Bristol Railway was opened—Brunel's Broad Gauges Line—which subsequently became the Great Western.

The Clearing House was established on 2nd January, 1842, with the object of adjusting the balances between the narrow gauge companies due to the interchange of traffic where passengers and goods were conveyed over the lines of two or more companies without transhipment; also for the charges for rolling stock running on foreign lines and demurrage, the accounts being cleared by the payment of the balances due. At the present time the Clearing House has developed into such an immense institution that the magnitude of its complicated transactions is bewildering to the uninitiated.

In 1842, the Shildon Tunnel was opened. It was projected by gentlemen interested in the Stockton and Darlington Railway, to avoid the heavy inclines on the Black Boy Branch.

In the following year (1843), the Bishop Auckland and Weardale Railway was opened, having a connection at the north end of the Shildon Tunnel, and terminating at Witton Park Colliery, near Crook. It was afterwards extended to the Stanhope and Tyne, at Waskerley, in 1845, under the title of the Weardale Extension.

The Newcastle and Darlington Railway, from Darlington to Rainton, was finished two years after obtaining the Act in 1842. It was formally opened on 18th June, 1844, when a train left Euston Square at 5 a.m., and arrived at Gateshead at 2.24 p.m.—the actual

time, deducting stoppages, was 6 hours 45 minutes, over 303 miles of railway, or at the average speed of 45 miles an hour. The distance, *via* Great Northern, is now 271½ miles. On its journey, the train had to pass over the lines of eight different Railway Companies, viz. :—

London and Birmingham to Rugby.  
 Midland Counties to Derby.  
 North Midland to Normanton.  
 York and North Midland to York.  
 Great North of England to Darlington.  
 Newcastle and Darlington to Washington.  
 Pontop and South Shields to Brockley Whins.  
 Brandling Junction to Gateshead.

This may be considered the most important epoch in the railway history of the Tyne—its connection by railway with the Thames. To commemorate the event a banquet was held in Newcastle, under the chairmanship of Mr. George Hudson, chairman of the Newcastle and Darlington Company

On three of the bridges of this line, which have a span of between 50 and 60 feet, cast-iron trussed girders were used. The arch having been found an inconvenient form for railway bridges under all conditions, principally on account of headway, the trussed girder was designed to overcome the difficulty. The first compound trussed girder of 60 feet span was erected over the River Lea by Mr. Bidder and Mr. Stephenson. The accident to the bridge over the Dee in 1847, however, discredited them. The span of the Dee bridge was nearly 100 feet, and the depth only 1-26th the span. The accident was supposed to be due to the additional dead-weight added by placing broken stones on the decking to protect it from fire. In all these bridges for double track two single track bridges were placed side by side. Two of the bridges mentioned have been replaced with wrought-iron girders. The bridge under the Simpasture Branch is still in use, but it is only subjected to the slow traffic of a mineral line. There is also a road bridge of this type over the Tees at Stockton.

A branch called the Belmont Branch, from Belmont to Gilesgate, was opened in 1843. It is now used as a goods line to the Durham Goods Station, which is situated at the latter place.

A short branch at Broomside, making a connection with the Durham and Sunderland Railways, was opened about the same time.

The opening of the Bristol and Gloucester Railway in 1844 brought the broad and narrow gauges into contact at Gloucester, causing great inconvenience in the transhipment of goods and passengers. This occurring at the height of the railway mania, when there were so many rival bills before Parliament, led to the appointment of a Gauge Commission in 1845, and on their report an Act—called the Gauge Act—was passed in 1846 confining all future railways to the narrow gauge.

Eventually, the Great Western directors found that Brunel's seven-foot gauge was a mistake, and in 1869 they commenced to partially alter it. With part broad, part narrow, and part mixed gauge, it continued until 1892, when the broad gauge disappeared, and the broad gauge stock was converted accordingly.

1846. Lancaster and Carlisle—now London and North-Western—was opened into Carlisle.

In 1836, Mr. Robt. Stephenson surveyed two routes between Newcastle and Edinburgh—one a coast line, *via* Berwick and Dunbar, and the other, an inland line, over the Carter Fell and the valley of the Gala. In 1838, he made another examination of the routes, and reported favourably upon the coast line, but nothing was done until after the opening of the Newcastle and Darlington Railway in 1844, when the scheme revived, and he was again consulted by the promoters, who adopted the coast line as the best route. An opposition line was started by Lord Howick and several landed proprietors, who engaged Mr. Brunel as Engineer, and with him came the Atmospheric Railway, which was then coming into favour in the South. The Stephensons resented Brunel coming to poach on what they considered their home preserves, and the introduction of the Atmospheric system, in which they had no faith,

on to the land within a stone throw of Killingworth, the birth place of the Killingworth Engine. A bitter Parliamentary contest ensued, out of which they came triumphant, fortunately for the shareholders, as the Atmospheric Railway died a natural death a few years later.

The Act was obtained in 1845, and two years after the line was opened, in 1847, from Heaton to Morpeth, in March, and from Chathill to Tweedmouth, in May, and the whole line opened 1st July. There are several fine stone viaducts over the River Blyth, Wansbeck, Coquet, and Alne. The Royal Border Bridge\* over the Tweed, connecting the line with the North British Railway at Berwick, was not completed until 1850. It forms a striking feature in the view obtained of Berwick, as seen from Tweedmouth. The Resident Engineer of the bridge was Mr. (now Sir) George Barclay Bruce, Past President of the Institute. Mr. George Hudson was Chairman of the Company, and Mr. R. Stephenson and Mr. T. E. Harrison, Engineers.

In 1845, the Weardale Extension was opened, it was a continuation of the Bishop Auckland and Weardale, past Crook and Tow Law to Waskerley, on what was originally the Stanhope and Tyne; on this line there was a heavy incline at Sunniside, which was closed on the formation of the Sunniside Deviation in 1868.

The North British opened their main line from Edinburgh to Berwick in 1846.

In 1847, the following lines were opened:—Seghill to Blyth, *via* Newsham (B. & T.); Swalwell Branch, Newcastle and Carlisle Railway; Wear Valley to Frosterley; and Bishopley Branch.

The Caledonian Railway opened their main line from Carlisle to Beattock, in 1847, and, in the following year, to Edinburgh and Glasgow. The Glasgow and South-Western Railway also obtained running powers over the Caledonian from Gretna into Carlisle in the same year.

In 1848, the Amble Branch was opened to Warkworth Harbour.

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\* Minutes of Proceedings Inst. C.E., vol. x., p. 219 (1851).

The Blyth and Tyne Railway Co. afterwards obtained an Act to extend their system to Amble, but it has not been made beyond Ashington.

In 1849, the Kelso Branch was opened to Sprouston Station, and shortly afterwards to Sprouston Junction, one mile further west—the limit of the N.E.R., which extends  $3\frac{1}{2}$  miles into Scotland. The North British continued the line to Kelso in the following year. The North British Main Line from Edinburgh to Hawick was opened in 1849.

The first train passed along the temporary bridge used in the erection of the High Level Bridge on the 29th August, 1848, and afterwards over the magnificent arch which spans Dean Street. The last key on the High Level Bridge was driven by Mr. Hawks on 7th June, 1849 ; it was opened without any ceremony on August 14th, but was not brought into ordinary use until the following February. It is unnecessary to describe the bridge, which is so well-known to you all. It is certainly a wonderful structure, built at a time when iron bridge building was in its infancy, and of a material (cast-iron) that is practically discarded in present practice. The design is unique and artistic, and it stands to-day as a striking monument to the memory of Robert Stephenson and those associated with him in its construction. The bridge is wide enough for three lines of rails on account of the width required for the roadway and footpaths underneath, but only two lines were laid on the top ; afterwards a third line was added, and regularly used as a siding, with a dead-end at the Gateshead end. This was in use for many years until converted into a third running line. In an illustration by Leitch, four lines are shewn on the bridge. This shews how little an artist's sketch can be relied upon as an historical data.

Twenty-five years after the opening of the Stockton and Darlington, London was connected with Edinburgh through Newcastle and Berwick, when Queen Victoria opened (29th August, 1850) the bridges over the Tyne and Tweed, and the Central Station, Newcastle—the beautiful facade of which we owe to Mr. John Dobson, who was responsible for so many fine buildings in Newcastle. Want of funds prevented its completion, and the

portico was not added until several years later (1863). The interior of the station with its lofty roofs, the graceful curves of which have been so much admired, and the arrangement of the platforms, with ready access from a central square, gave it a compactness superior to any other large station in the country. Unfortunately, the extensions and alterations required by increasing traffic have contributed neither to its convenience nor to its beauty. The station was provided with numerous turn-tables for the shunting and sorting of trains. This method of working will be well within the memory of the older members, as well as the loading of passengers' luggage on the top of the carriages, the hasty erection of wooden shoots against the sides, the scrambling of porters up to the roofs, and the sudden descent of heavy packages on to the platform added to the excitement and confusion at the arrival of a train—if it did not contribute towards the life of your portmanteau. It has been stated that the present handling of passengers' luggage shews little improvement in that respect.

In the same year (1850) a branch was opened from Washington to Pelaw, which diverted the main line from the Pontop and South Shields Railway, and shortened the distance to Newcastle by  $3\frac{1}{4}$  miles.

1850. Branch opened to Alnwick.

In 1852, the Leeds and Thirsk Railway was opened to Stockton, when, in connection with the West Hartlepool Railway (Old Clarence Railway), a keen competition arose with the York and North Midland, and the York, Newcastle, and Berwick Railways, for the traffic to the North, the former carrying passengers from Leeds to Ferryhill for two shillings, and the latter giving them a return to Newcastle for the same amount. By the efforts of Mr. Henry Tennant, then Manager of the Leeds Northern Railway, an amalgamation was effected, and this was the first step towards the formation of the North-Eastern Railway Company, of which Mr. Tennant was afterwards General Manager for many years, and, on his retirement, was elected a Director, which position he still holds.

In 1852, the Alston Branch of the Newcastle and Carlisle Railway was opened. It runs up the higher reaches of the South Tyne,

which is crossed by stone viaducts at Haltwhistle and Lambley. It has also a short branch at Lambley in connection with the Kirkhouse Private Railway, which runs to Brampton. Great expectations were entertained as to the importance of the traffic from the lead mines, these have not been realized, as the industry has almost died out.

The Penshaw Branch was opened in 1852, giving a connection from the York, Newcastle, and Berwick Railway to South Dock, Hendon, which was opened in the same year. The docks are now under the management of the River Wear Commissioners.

The York, Newcastle, and Berwick Railways Bill, for amalgamating that line with the York and North Midland and the Leeds Northern Railways, received the Royal assent 31st July, 1854. The united lines were afterwards called the North-Eastern Railway. The extent of mileage was greater than that possessed by any other Company in the kingdom, embracing 720 miles, and the capital of the undertaking was about twenty-three millions sterling. No less than 68 Acts of Parliament were recited in the Amalgamation Act. Mr. James Pulleine, late Chairman of the Newcastle and Berwick, and Chairman of the United Board of the above railways from 1853 to 1855, was elected Chairman, but was succeeded the following year by Mr. H. S. Thompson, afterwards Sir H. S. Meysey Thompson, Bart., who retained that position for 20 years. Mr. T. E. Harrison was appointed Engineer, and Capt. W. O'Brien General Manager.

#### CHAIRMEN OF NORTH-EASTERN RAILWAY.

Mr. James Pulleine, 1854 to 1855.

Sir H. S. Meysey Thompson, Bart., 1855 to 1874.

Mr. George Leeman, 1874 to 1880.

Mr. John Dent Dent, 1880 to 1894.

Sir Joseph Whitwell Pease, Bart., 1895.

#### GENERAL MANAGERS OF NORTH-EASTERN RAILWAY.

Captain W. O'Brien, 1854 to 1871.

Mr. Henry Tennant, 1871 to 1891.

Mr. George Stegman Gibb, 1891.

In 1856, a railway was proposed from Consett to Stocksfield, under the title of "The Stockton and Darlington and Newcastle and Carlisle Union Railway," it, however, was not proceeded with.

In 1856, the Auckland Branch (Tunnel Branch) was opened from the North end of Shildon Tunnel to West Auckland. In the same year, the railway from Darlington to Barnard Castle was eventually opened, after several attempts to overcome the opposition of the Duke of Cleveland to the line.

The Bishop Auckland Branch from Leamside on the main line through Durham City to Bishop Auckland was opened in 1857. On it are stone viaducts over the Wear and at Durham; a timber viaduct over the Browney was replaced by a brick viaduct in 1897, and another over the River Dearness is being dealt with in a similar manner.

In 1857, the Northumberland Dock was opened on the Tyne, having taken three years to construct. There are several coal staiths in the Dock belonging to the various collieries, who had wagon-ways running down to the river previous to its construction; there were also some belonging to the Blyth and Tyne Railway. The dock is the property of the River Tyne Commissioners.

A line from Bedlington to Morpeth (B. and T.) was opened in 1858.

In 1858, the Border Counties Railway was partially opened from Hexham to Chollerford. It is now part of the North British system, and joins the Waverley route at Rickerton after running up the valley of the North Tyne.

The Dearness Valley Branch from Brooms to Waterhouses, and the Stanley Branch from Crook to Waterhouses, were opened in the same year (1858), the former by the N.E.R. and the latter by the S. and D. They were principally mineral lines. A passenger service runs between Durham and Waterhouses.

The Waskerley Deviation between Rowley and Hownes Gill was opened in 1859 in place of a portion of the old Stanhope and Tyne, which was then abandoned. It crosses the Hownes Gill parallel to the original steep inclines before referred to by a stone viaduct by Bouch, the design of which has been much criticised.

In the same year (1859), a branch was opened from Bedlington to North Seaton (B. and T.).

In 1847, an Act had been obtained by the York, Newcastle, and Berwick Railway Company for the construction of a dock at Jarrow Slake. The contract was let, but the work was not proceeded with, owing to the crisis in the Company's affairs. Mr. T. E. Harrison revived the scheme after the N.E.R. amalgamation, and another Act was obtained in 1854. The dock is situated on the eastern side of the Slake, where the depth of the silt added greatly to the difficulties of construction; these were eventually overcome, and the Tyne Dock opened on the 3rd March, 1859. The branch from Green Lane to the dock had been opened two years previously. It was used as an import dock for timber and grain, but principally for the export of coal, for which two jetties were at first provided. Two additional jetties have since been added. Last year over 7,000,000 tons were shipped, representing a train of 10-ton wagons over 2,700 miles in length. The dock has a water area of about 50 acres, and the sidings in connection with it measure 61 miles in length. In introducing the method of manipulating the wagons at the coal jetties entirely by gravitation, Mr. Harrison was possibly influenced by his experience of the "inclines" on the Stanhope and Tyne Railway, the nature of the ground at Tyne Dock lending itself readily to this method. On the arrival of a train of coals at the dock they gravitate into one of the groups of sidings called "fields," from whence they pass to the spouts as required, the empty wagons falling back into "holes" at either side of the "fields," from whence they are removed by locomotives. Although the staiths were originally designed for the use of chaldron\* wagons, 8-ton and 10-ton wagons have been exclusively used for many years; recently a 32-ton wagon has been tried upon them.

\*The chaldron was formerly the standard measure for coals; it varied in different localities. A Newcastle chaldron measured 24 bolls, containing 53 cwt. of coal. The wagons were built to contain one chaldron; they are now made to carry  $1\frac{1}{4}$  chaldrons, or about 4 tons. Many of the latter are still in use, especially where the coal staiths and colliery screens will not admit of larger wagons. On the old coal drops on the Tyne and Wear, some of which are still in use, these wagons were lowered to the level of the ship's deck before the coals were discharged.

15-ton wagons are now being built by the North-Eastern Railway Company. They have the same wheel base as the 10-ton wagons, the extra capacity is obtained by an addition to the height and a modification of the hopper which necessitates the use of eight bottom-doors. Experiments are also being conducted with 32-ton steel wagons (Sheffield and Twinberrow Patent).

Since the date of this Address, an order has been issued for fifty 40-ton wagons of the above type.

The following extract from Mr. T. E. Harrison's Paper on Tyne Docks\* is of interest :—

“The wagons generally in use in the North of England, for carrying coals to the place of shipment, have undergone but little change for the last fifty years. Each wagon is made to contain a Newcastle chaldron of 53 cwt., and until within the last few years each wagon was measured by the Custom House officers, and branded with a crown. The wheels are generally of cast-iron, and the axles run in a metal cod without any axle-box. The friction resulting from this arrangement, and the exposure of the grease to the coal dust, are very considerable. On the North-Eastern system, wagons carrying three Newcastle chaldrons, or eight tons, with wrought-iron wheels, springs, spring buffers and spring draw-bars have been introduced. After three years' experience, the advantages have been proved to be so great, in every respect, that it has been decided gradually to replace the old chaldron wagons by the eight-ton wagons.”

In 1860, an agreement was entered into between the Great Northern, North-Eastern, and North British Railway Companies to run a through service between London and Edinburgh, each company to provide and maintain a certain number of vehicles, in some proportion to the mileage of each company's line, viz.:—Great Northern, 40 per cent. ; North-Eastern, 35 per cent. ; North British, 25 per cent. The Caledonian Railway was also interested in the agreement to a small extent. The first stock consisted of 50 vehicles ; in 1885, there were 123 vehicles ; in 1890, 145 ; in 1891, 170. In 1893, the East Coast Dining Trains were added to the stock, and the total number in 1894 was 231. At the present time, the total stock consists of 342 vehicles, shewing the increase and importance of the East Coast traffic. The stock is kept entirely for this special service, and the Clearing House keep a separate account of the running of the vehicles.

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\* “Tyne Docks at South Shields, and the mode adopted for Shipping Coals.” Minutes of Proceedings Inst. C.E., vol. xviii., page 490. (1859).

In 1860, a line was opened on the Blyth and Tyne, from Hartley to North Shields, running partly on the site of old wagon-ways from Hartley to Seaton Sluice, and from Whitley Colliery to the Low Lights at North Shields. The new portion of the line was called the Tynemouth Branch (part of which is now the Avenue Branch). It did not extend beyond the Mariners' Hospital at Tynemouth.

On the 7th August, 1861, the South Durham Railway was opened from St. Helen's, Auckland, to Barnard Castle and Tebay, connecting the South Durham coalfield with the railways on the West coast at the latter place—on it are several iron viaducts by Bouch. After passing Stainmoor Summit, and in descending the heavy gradient of about 1 in 60 for nine miles into Kirkby Stephen, a magnificent view is obtained, under favourable atmospheric conditions, of the valley of the Eden and the surrounding hills, it is, perhaps, the finest view from any railway in England.

In 1862, the Newcastle and Carlisle Railway Company was amalgamated with the North-Eastern, and, in the following year (1863), the Stockton and Darlington was absorbed in the same manner.

Lanchester Valley Branch opened in 1862 to Derwent Iron Works (commenced 1840, re-named Consett Iron Works 1864). On this line there is a large timber trestle viaduct at Lanchester. The gradients west of Lanchester are 1 in 60, the iron works being situated at a height of about 800 feet above sea level.

1862. Eden Valley Railway opened from Kirkby Stephen to Penrith, and the Redhills Loop, near Penrith, in 1866.

1862. The North British ran their main line from Hawick into Carlisle.

1862. The Wear Valley Branch was extended from Frosterley to Stanhope.

About 1863, a short branch was made to the Corporation Quay at Gateshead. The Quay was little used, and the line has been disused for many years.

June, 1864. The Blyth and Tyne opened a line from New Bridge Street, Newcastle, to Monkseaton, joining the old Tynemouth

Branch, and forming a complete line from Newcastle to North Shields. It was afterwards extended to Tynemouth in 1866, in competition with the N.E.R. for the seaside traffic. A connection was also made with their main line at Backworth, which enabled a passenger service to be run between Newcastle and Blyth, in place of that between Percy Main and Blyth. This is a cheap surface line with many gradients.

1865. Pallion and Deptford Branches at Sunderland, over which the Lambton Collieries run their coals from the Penshaw Branch to their coal staiths on the Wear.

1865. Wansbeck Valley Railway was opened throughout. (Now North British).

1866. Harton Branch, from Tyne Dock to Cleadon, providing a more direct route between South Shields and Sunderland than by the old route *via* Brockley Whins.

1867. Conside Branch, up the valley of the Derwent. It joins the Lanchester Valley Branch at Consett. It has steep gradients of 1 in 60. In connection with it are branches to the Redheugh Branch at Blaydon, and to the Waskerley Deviation at Hownes Gill, giving access to Crook and Bishop Auckland.

1868. Team Valley Line from Gateshead to Newton Hall, near Durham, on the Bishop Auckland Branch: on it there are three large viaducts. This is now the main line from York to Newcastle.

1868. Tees Valley Branch, opened from Barnard Castle to Middleton-in-Teesdale.

1868. Sunniside Deviation between Crook and Tow Law for the purpose of forming a locomotive line in place of the inclined planes.

1869. Hexham and Allendale Branch, the property of a private company, who anticipated a large amount of traffic from the Lead Works in Allendale; this industry has quite died out. The gradients are steep, and the scenery is very interesting. The Railway was afterwards purchased by the N.E.R.

1870. Branch to Newcastle Quay through two long tunnels; gradients 1 in 27 and 1 in 30.

1870. Rothbury Branch, part of the proposed Northumberland Central Railway. (Now North British).

1872. Ferryhill Extension—Durham to Ferryhill—completing the new main line in connection with the Team Valley.

1872. North Seaton to Newbiggin, the last branch made by the Blyth and Tyne Company.

1872. Pelaw and Tyne Dock Branch. It runs along the South bank of the river through Hebburn and Jarrow; great difficulty was experienced in forming the embankment over the estuary of the River Don, owing to the depth of the silt. A connection was made with Tyne Dock by a short branch, which was closed after the opening of a new branch to the West side of the dock from St. Bede's Junction. On the opening of the line, the passenger traffic between Newcastle and South Shields was diverted from the old route *via* Brockley Whins and Green Lane Junction, on the Pontop and South Shields Railway, where all the coal traffic for the dock has to be dealt with. Extensive alterations are now in progress at this junction, including a Road Bridge over the railway to enable the dangerous level crossing, over seven lines of rails, to be closed. An Electric Pneumatic Installation (high pressure) for working the points and signals is being laid down, which will be brought into use in about seven months' time.

In 1874, the Blyth and Tyne Railway was vested in the North-Eastern Railway, much to the advantage of the district which it served. Many improvements have since been made, and a large amount of capital sunk at Blyth in the erection of additional staiths with the necessary branches. The Port of Blyth has risen to importance in the shipping world, which has added materially to the prosperity of the town. Last year, the coals shipped amounted to  $3\frac{1}{4}$  million tons.

From this date the North-Eastern Railway Company controlled the railways in Northumberland, Durham, and the whole of East Yorkshire. They have not rested upon their oars, but launched out with new capital in improving the existing works and making

numerous extensions, as the following works carried out within the last twenty-five years will shew :—

In 1875, the Midland Railway opened their Settle and Carlisle line with running powers over a portion of the North-Eastern at Carlisle

1875. Scotswood, Newburn, and Wylam Railway, made by a private company, afterwards purchased by the North-Eastern Railway. It runs for a considerable portion of its length on the old "Wylam waggon-way," upon which Hedley's engine worked, and adjacent to the house where George Stephenson was born. Mr. W. G. Laws, M. Inst. C.E., was the Engineer. The only interesting work on it is the wrought-iron braced arch of 240 feet span which crosses the Tyne at West Wylam,\* and from which the platform carrying the railway is suspended as in the carriage road and footways on the High Level Bridge.

1876. Hylton, Southwick, and Monkwearmouth Railway made by a private company ; afterwards purchased, in 1883, by N.E.R.

Considerable additions have been made, from time to time, to the Docks at the Hartlepools since the opening of the first Dock in 1835. The extensive alterations made in 1872-81 were carried out under the direction of Mr. Charles A. Harrison, the Resident Engineer. In connection with this work, the loop line between East and West Hartlepool was diverted outside the Dock area and opened in 1877.

1877. Castle Eden to Bowesfield (near Stockton), giving more direct access to Stockton from Sunderland with branches at Wingate (1877) and Carlton (1878).

1877. Baxter Wood connections near Durham.

1878. Tweedmouth Dock Branch, which failed to galvanize life into the port.

1879. Byker, Walker, and Percy Main (Riverside Railway). It is made partly on the route of Mr. Joshua Richardson's scheme of 1830, and partly on that of Mr. John F. Tone, who resuscitated the

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\* "Railway Bridge over the Tyne, at Wylam, Northumberland." Minutes of Proceedings Inst. C.E., vol. lvi., p. 262. (1879.)

scheme about 1872. There are forty-eight bridges on it, in a distance of six and a half miles. This line has been much more successful than was originally anticipated.

1879. Monkwearmouth and Sunderland were joined by an iron girder bridge over the Wear, of 300 feet span, and a new central station made at Sunderland ; previous to this Sunderland enjoyed the possession of three separate stations, some considerable distance apart. The line was also extended to Ryhope Grange, on the Durham and Sunderland Railway ; and now a fast service of trains run, *via* Sunderland, Stockton, and Leeds, to Manchester and Liverpool.

1879. An extension at South Shields, which provided a new station in the centre of the town, on a site on the old Stanhope and Tyne.

On the 9th June, 1881, the "Stephenson Centenary" was celebrated in Newcastle. On that occasion a procession of modern locomotives passed along the railway in front of the house at Wylam in which George Stephenson was born. There were sixteen engines representing seven different Railway Companies. They were afterwards exhibited in Newcastle, together with five old engines, when an opportunity was afforded the public of inspecting and comparing them. The development of the locomotive is still in operation. The demand for additional power and speed is responded to by Locomotive Engineers, and the consequent extra strain upon the permanent way and works has to be provided for, but the raising of the standard of permanent works is a question of time and money. The relative strength of the permanent way to the weight of the engines opens up the same question to-day as it did in 1813, *viz.*, that of cost.

1882. The Tynemouth Extension, where a portion of the old Blyth and Tyne, from Monkseaton to Tynemouth, was abandoned, and the line diverted nearer the coast. A large new station was built at Tynemouth, in place of the two previous ones. The opening of this line has developed Whitley and Cullercoats very considerably.

1884. Blyth Staiths reconstructed.

1884. The Coble Dene Dock, belonging to the River Tyne Commissioners, was opened by the Prince of Wales, it was then re-named Albert Edward Dock. The Norwegian passenger boats are berthed in the dock, and in 1891 the lines from Percy Main were altered and passed for passenger traffic, to permit of a Boat Train being run in connection with their arrival and departure. The area of the dock is 24 acres; it is provided with one coal shipping staith.

1885. Branch from Spennymoor to Bishop Auckland.

1886. Annfield Plain Deviation and the abandonment of the Loud Bank, with its stationary engine and inclines; also, a short branch at Consett Junction, in connection with the Consett and Lanchester Valley Branches. These alterations enabled the whole of the traffic west of Stanley Bank Head to be worked by locomotives. The short branch at Consett was afterwards abandoned, and another branch substituted when altering the line from Annfield to Consett, for passenger service, in 1896.

1887. The Alnwick and Cornhill passes over the summit of Alnwick Moor, by gradients of 1 in 50, for nearly three miles on either side, through the valley at the foot of the Cheviots, past Wooler and Kirknewton to Coldstream on the Kelso Branch. The northern portion of the proposed Northumberland Central Railway ran through this district.

1888. New Staiths at New Blyth, and branch from Newsham.

The 20th March, 1888, marks the close of the life of Mr. Thomas Elliot Harrison, after an honourable career of fifty-five years of railway work in this district. As early as 1833, he was associated with Mr. Robert Stephenson, as Engineer to the Stanhope and Tyne, and afterwards on the Durham Junction, Newcastle and Darlington, Newcastle and Berwick, and the High Level Bridge. On the retirement of Mr. Stephenson, in 1849, he was appointed Engineer, with supervision over the general business of the York, Newcastle, and Berwick Railway, whose affairs, under the Chairmanship of Mr. George Hudson, had not been prosperous. On the formation of the North-Eastern System, he was appointed Engineer-in-Chief,

which position he retained until his death, in his eightieth year, universally respected and much esteemed for his integrity and ability. He became a Member of the Institute in 1834, and was elected President in 1873.

From this period the duties of Engineer of the Northern Division have been undertaken by Mr. Charles A. Harrison, M. Inst. C.E., Past President of this Association.

In 1893, the new Staiths at Dunston were opened, together with the Dunston Extension Railways, which gave access to them from the Team Valley at Low Fell, and the Redheugh Branch at Dunston. In connection with the shipments of coals at Dunston, a locomotive line was made from Annfield to South Pelaw, on the Pontop and South Shields, and Ouston on the Team Valley, which relieved the congestion of traffic upon the inclines of the former, and provided facilities for a passenger service to Annfield Plain. The line rises 654 feet in  $7\frac{1}{2}$  miles, the ruling gradient being 1 in 50. Great difficulty was experienced in passing over the Hellhole landslip, at Beamish.

1893. Durham Elvet Extension—a short branch from Sherburn House to Durham Elvet, in lieu of the old line (since abandoned) to Shincliffe, the original terminus of the Durham and Sunderland Railway, where the station was at an inconvenient distance from the town. On it is a single span (130 feet) wrought-iron arched bridge over the Wear, close to Durham.

1893. The extensive alterations at the Central Station, Newcastle, were completed.

1895. Central to Manors Widening, in connection with the above. In carrying out this work the existing arch of 80 feet span over Dean Street had to be widened for four lines of rails; the formation of the streets necessitated a bridge of a longer span, the simplest method would have been to have spanned the opening with girders, but as this would have been a piece of gross vandalism, Mr. Harrison decided to throw over another arch of 106 feet span, the result has been that the beauty of the old bridge has been rather enhanced than otherwise. The whole of the bridge is built of grey

granite; very heavy centering had to be erected to allow the road traffic to be maintained underneath, the deflection of the arch on striking the centers was only  $\frac{1}{4}$ -inch. The height of the crown of the arch from the street is about 70 feet.

1895. Stanhope to Wearhead, an Extension of the Wear Valley Railway.

1896. North Blyth Staiths and Branch from Cambois; the Cambois Branch was also doubled to provide for the additional traffic. The staiths are in two portions and have eight coal spouts. The gravitation system is adopted in working the staiths, but the procedure is exactly the reverse of that at Tyne Dock, the full wagons are pushed up to the end of the staiths, and they gravitate back to the coal spouts and afterwards to a nest of sidings provided for the empties.

1898. The North Sunderland Light Railway was opened from Chathill on the N.E.R. to Seahouses—a distance of four miles. It is the only passenger line in this district worked by a private company, with the exception of the Marsden Railway, between South Shields and Whitburn Colliery. Passengers used to be carried on a portion of the Kirkhouse Railway from Brampton Junction on the N.E.R. to the town of Brampton. This was discontinued a few years ago, owing to the proprietors not being willing to reduce the fares and alter the line to meet the requirements of the Board of Trade. Brampton is now suffering from the isolation it demanded in the early days of railway enterprise.

In 1900, the N.E.R. purchased the Londonderry Railway between Seaham Harbour and South Docks, Sunderland. It was opened for coal traffic on the 6th March, 1854, and for passengers on 1st July, 1855. A junction was made with the Durham and Sunderland Railway at Hendon on the opening of the line, and the passenger trains were diverted through it into the Hendon Station (N.E.R.) on the 1st October, 1868. On the opening of the Monkwearmouth Extension, from Monkwearmouth to Ryhope Grange, a junction was made at the latter place, and the passenger trains from Seaham Harbour were run direct into Sunderland New Station on 4th August, 1879, the Hendon Station being closed.

Besides these new railways, several portions of the line were widened and doubled at great cost, viz. :—

- 1872. Ferryhill (widening and alterations).
- 1872. Newton Hall to Durham (widening).
- 1874. Annfield and Stanley (doubling).
- 1876. Dearness Valley (doubling).
- 1878. Murton and Shotton (doubling).
- 1882. Harton Branch (doubling).
- 1884. Stillington to Carlton (widening).
- 1887. Manors to Heaton (widening).
- 1893. Central to Forth (widening).
- 1895. Central to Manors (widening).
- 1896. Felling to Pelaw (widening).
- 1896. Cambois Branch (doubling).
- 1898. Scotswood to Elswick (widening).

and doubling several portions of the Lanchester Valley and Consett Branches at different periods between 1871 and 1883, and at other places of minor importance.

Having now come to the close of the century, and looking back upon the work of the last seventy-five years, we find that between 700 and 800 miles of railways on the N.E.R. system have been made in the two counties, and this portion forms the busiest section of the Railway, whose authorised capital is now over £77,000,000. Its total mileage is 1,656 miles. It owns 2,121 locomotives, 3,831 carriages, 42,519 goods wagons, 55,729 mineral wagons, or a total of 104,290. It has been asserted that the North-Eastern Railway was taken out in penny numbers; it will not be denied that it nevertheless forms a very handsome volume.

At the present time the North-Eastern Railway has many important extensions and improvements in hand, and others in contemplation.

The new line between Hartlepool and Seaham along the Durham coast is approaching completion. It will open an alternative route to Hartlepool, with better gradients than on the existing line. It passes through a valuable mineral district, and several large collieries

